

# EXHIBIT E

IPR2021-00179  
PATENT NO. 8,407,273

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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GOOGLE LLC,

Petitioner,

v.

SINGULAR COMPUTING LLC,

Patent Owner.

Patent No. 8,407,273  
Filing Date: February 17, 2012  
Issue Date: March 26, 2013

Inventor: Joseph Bates  
Title: PROCESSING WITH COMPACT ARITHMETIC  
PROCESSING ELEMENT

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**PATENT OWNER'S  
PRELIMINARY RESPONSE**

Case No. IPR2021-00179

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## I. INTRODUCTION

On November 6, 2020, Google LLC (“Google” or “Petitioner”) submitted a Petition for *Inter Partes* Review (“Petition”) of U.S. Patent No. 8,407,273 (Ex. 1001, “the ’273 Patent”), challenging Claims 1-26, 28, 32-61, 63, and 67-70 pursuant to §§ 311-319 and § 42.100, *et seq.* (“the Challenged Claims”).

The Petition should be denied because the Petitioner has failed to demonstrate a reasonable likelihood that the Challenged Claims are invalid as obvious under 35 U.S.C. § 103(a) based on the prior art references and obviousness grounds set forth in the Petition. The prior art references and obviousness grounds cannot render the Challenged Claims obvious because they fail to disclose all of the elements required by the Challenged Claims for at least two reasons.

First, none of the cited references disclose a low precision, high dynamic range (LPHDR) execution unit, either physical or emulated, as recited in all Challenged Claims. The primary reference, Dockser, does not disclose an LPHDR execution unit. Rather, Dockser discloses a floating-point processor (FPP) with *adjustable* precision: it operates at full precision unless a lower “subprecision” level is selected. Indeed, Dockser teaches away from execution units that operate *only* at low precision (like the LPHDR execution units of the Challenged Claims), suggesting that such processors are unsuitable for many applications in which

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“greater precision may be needed.” Ex. 1007, Dockser ¶ [0003]. In the context of these remarks, a person of ordinary skill in the art would not have been motivated to transform the adjustable, full-precision FPPs of Dockser into the LPHDR execution units of the ’273 Patent.

Second, the cited references do not disclose the following requirement, recited in each of the Challenged Claims:

“for at least  $X=5\%$  of the possible valid inputs to the first operation, the statistical mean, over repeated execution of the first operation on each specific input from the at least  $X\%$  of the possible valid inputs to the first operation, of the numerical values represented by the first output signal of the LPHDR unit executing the first operation on that input differs by at least  $Y=0.05\%$  from the result of an exact mathematical calculation of the first operation on the numerical values of that same input.”

This limitation (herein called “the imprecision limitation”), requires that executing the first operation on at least 5% of all of the *possible* valid inputs yields results that are at least 0.05% imprecise.<sup>1</sup>

As explained in detail below, this requirement that the claimed LPHDR execution unit yields imprecise results for the first operation over at least a certain

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<sup>1</sup> Certain dependent claims change X to 10% and/or Y to 0.1, 0.15, or 0.2%. See Ex. 1001, ’273 Patent at claims 11-17, 46-52.

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**CERTIFICATE OF WORD COUNT**

The undersigned hereby certifies that the portions of the above-captioned SINGULAR COMPUTING LLC'S PRELIMINARY RESPONSE TO PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,407,273 specified in 37 C.F.R. § 42.24 has 6,889 words in compliance with the 14,000 word limit set forth in 37 C.F.R. § 42.24. This word count was prepared using Microsoft Word 2020.

Respectfully Submitted,

Dated: February 24, 2021

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